### ANNA UNIVERSITY, CHENNAI – 600 025
UNIVERSITY DEPARTMENTS
R - 2017
B.E. (PART-TIME) MECHANICAL ENGINEERING
I - VII SEMESTER CURRICULA AND SYLLABI
SEMESTER I

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OBJECTIVES:

- To facilitate the understanding of the principles and to cultivate the art of formulating physical problems in the language of mathematics.

UNIT I MATRICES

Characteristic equation – Eigen values and Eigenvectors of a real matrix – Properties of eigen values and eigenvectors – Cayley Hamilton theorem – Diagonalization of matrices - Reduction of a quadratic form to canonical form by orthogonal transformation.

UNIT II FUNCTIONS OF SEVERAL VARIABLES


UNIT III ANALYTIC FUNCTION

Analytic functions – Necessary and sufficient conditions for analyticity – Properties – Harmonic conjugates – Construction of analytic function – Conformal Mapping – Mapping by functions w = a + z, az, 1/z, - Bilinear transformation.

UNIT IV COMPLEX INTEGRATION


UNIT V LAPLACE TRANSFORMS


TOTAL: 45 PERIODS

OUT COMES:

- To develop the use of matrix algebra techniques this is needed by engineers for practical applications.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

TEXT BOOK:

REFERENCES:

PTGE7151 COMPUTING TECHNIQUES
(Common to all branches of Engineering and Technology) 3 0 0 3

OBJECTIVE
• To learn programming using a structured programming language.
• To provide C programming exposure.
• To introduce foundational concepts of computer programming to students of different branches of Engineering and Technology.

UNIT I INTRODUCTION
Introduction to Computers – Computer Software – Computer Networks and Internet - Need for logical thinking – Problem formulation and development of simple programs - Pseudo code - Flow Chart and Algorithms.

UNIT II C PROGRAMMING BASICS

UNIT III ARRAYS AND STRINGS

UNIT IV POINTERS
Macros - Storage classes –Basic concepts of Pointers– Pointer arithmetic - Example Problems - Basic file operations

UNIT V FUNCTIONS AND USER DEFINED DATA TYPES

TOTAL: 45 PERIODS

OUTCOME
At the end of the course, the student should be able to:
• Write C program for simple applications
• Formulate algorithm for simple problems
• Analyze different data types and arrays
• Perform simple search and sort.
• Use programming language to solve problems.
TEXT BOOKS:

REFERENCES:

PTCY7151 ENGINEERING CHEMISTRY L T P C
3 0 0 3

OBJECTIVE
- To develop an understanding about fundamentals of polymer chemistry.
- Brief elucidation on surface chemistry and catalysis.
- To develop sound knowledge photochemistry and spectroscopy.
- To impart basic knowledge on chemical thermodynamics.
- To understand the basic concepts of nano chemistry.

UNIT I POLYMER CHEMISTRY
Introduction: Functionality-degree of polymerization. Classification of polymers- natural and synthetic, thermoplastic and thermosetting. Types and mechanism of polymerization: addition (free radical, cationic, anionic and living); condensation and copolymerization. Properties of polymers: Tg, tacticity, molecular weight-weight average, number average and polydispersity index. Techniques of polymerization: Bulk, emulsion, solution and suspension.

UNIT II SURFACE CHEMISTRY AND CATALYSIS

UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY
UNIT IV CHEMICAL THERMODYNAMICS
Second law: Entropy-entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Free energy and work function: Helmholtz and Gibbs free energy functions; Criteria of spontaneity; Gibbs-Helmholtz equation; Clausius Clapeyron equation; Maxwell relations-Van’t Hoff isotherm and isochore. Chemical potential; Gibbs-Duhem equation- variation of chemical potential with temperature and pressure.

UNIT V NANO CHEMISTRY

TOTAL: 45 PERIODS

OUTCOMES:
- Will be familiar with polymer chemistry, surface chemistry and catalysis.
- Will know the photochemistry, spectroscopy and chemical thermodynamics.
- Will know the fundamentals of nano chemistry.

TEXTBOOKS:

REFERENCES:
UNIT II EQUILIBRIUM OF RIGID BODIES 9

UNIT III DISTRIBUTED FORCES 9
Centroids of lines and areas—symmetrical and unsymmetrical shapes, Determination of Centroids by Integration, Theorems of Pappus-Guldinus, Distributed Loads on Beams, Center of Gravity of a Three-Dimensional Body, Centroid of a Volume, Composite Bodies, Determination of Centroids of Volumes by Integration.

Moments of Inertia of Areas and Mass—Determination of the Moment of Inertia of an Area by Integration, Polar Moment of Inertia, Radius of Gyration of an Area, Parallel-Axis Theorem, Moments of Inertia of Composite Areas, Moments of Inertia of a Mass-Moments of Inertia of Thin Plates, Determination of the Moment of Inertia of a Three-Dimensional Body by Integration.

UNIT IV FRICTION 9

UNIT V DYNAMICS OF PARTICLES 9

TOTAL: 45 PERIODS

OUTCOME:
Upon completion of this course, students will be able to construct meaningful mathematical models of physical problems and solve them.

TEXT BOOK

REFERENCES
OBJECTIVE:
- To introduce the basic physics concepts relevant to different branches of Engineering and Technology.

UNIT I  PROPERTIES OF MATTER

UNIT II  ACOUSTICS AND ULTRASONICS

UNIT III  THERMAL AND MODERN PHYSICS

UNIT IV  APPLIED OPTICS

UNIT V  CRYSTAL PHYSICS
Single crystalline, polycrystalline and amorphous materials – Single crystals: unit cell, crystal systems, Bravais lattices, ditections and planes in a crystal, Miller indices - interplanar distance for a cubic crystal - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - structure and significance of NaCl, CsCl, ZnS and graphite - crystal imperfections: point defects, line defects – Burger vectors, dislocations and stacking faults – Growth of single crystals: Bridgman and Czochralski methods.

TOTAL: 45 PERIODS

OUTCOME:
- The students will acquire knowledge on the basics of physics related to properties of matter, optics, acoustics etc., and they will apply these fundamental principles to solve practical problems related to materials used for engineering applications.
TEXTBOOKS:

REFERENCES:

PTEE7204 BASIC ELECTRICAL ENGINEERING AND MEASUREMENTS

OBJECTIVES:
To impart knowledge on
- Electric circuit laws
- Principle of Electrical Machines
- Various measuring instruments

UNIT I ELECTRICAL CIRCUITS  9

UNIT II ELECTRICAL MACHINES  9

UNIT III SPECIAL ELECTRICAL COMPONENTS  9
Synchronous machine – Brushless DC Motor - Stepper motor – Switched reluctance motor-
Electromechanical Relays.

UNIT IV ELECTRICAL MEASUREMENTS  9

UNIT V MECHANICAL MEASUREMENTS  9
Classification of transducers, strain, RTD, thermocouples, Piezo-electric transducer, LVDT, Turbine and electromagnetic flow meters, level transducers ultrasonic and fiber optic transducers, type of sensors, elastic sensors, viscosity, moisture and pH sensors, Digital transducers, vibrating wire instruments like load cells, stress meter, etc.

TOTAL : 45 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:
- Explain different types of electrical machines and their performance.
TEXT BOOKS:

REFERENCES:

PTEC7204 ELECTRONICS ENGINEERING

OBJECTIVE:
- To provide knowledge in the basic concepts of Electronics Engineering including semiconductors, transistors, electronic devices, signal generators, transducers and digital electronics.

UNIT I SEMICONDUCTORS AND RECTIFIERS
P-N junction, VI Characteristics of PN junction diode, Zener diode, Zener diode Characteristics, Zener diode as a regulator, BJT and N-MOSFET working and V-I characteristics.

UNIT II AMPLIFIERS AND OSCILLATORS

UNIT III LINEAR INTEGRATED CIRCUITS
Operational amplifier –Inverting and Non-inverting amplifiers, Adder, integrator and differentiator, Instrumentation amplifier, Digital to Analog converters - R-2R and weighted resistor types, Analog to Digital converters - Successive approximation and Flash types, IC 555 based Astable and Monostable Multivibrators,

UNIT IV DIGITAL ELECTRONICS

UNIT V TRANSDUCERS AND DISPLAY DEVICES
Thermistors, Semiconductor strain gauges, LVDT, Tachometer, Ultrasonic and Thermal flow meter, pressure force and weight measurement, Seven segment display, LED and LCD

TOTAL : 45 PERIODS
OUTCOME:
Upon completion of this course, the students will be able to:

- Identify and apply electronics components to design circuits.

TEXT BOOK:

REFERENCES:
5. Transducers in Mechanical and Electronic Design by Tritelye

PTME7201 ENGINEERING THERMODYNAMICS L T P C

OBJECTIVE:
- To train the students on the basics and applications of energy in Mechanical Engineering

UNIT I BASIC CONCEPTS AND FIRST LAW 9

UNIT II SECOND LAW 9

UNIT III PURE SUBSTANCES AND STEAM POWER CYCLE 9
Steam - formation and its thermodynamic properties - p-v, p-T, T-v, T-s, h-s diagrams. PVT surface. Determination of dryness fraction. Calculation of work done and heat transfer in non-flow and flow processes using Steam Table and Mollier Chart. Ideal and actual Rankine cycles.

UNIT IV IDEAL AND REAL GASES THERMODYNAMIC RELATIONS 9

UNIT V GAS MIXTURES AND PSYCHROMETRY 9
Mole and mass fractions – Dalton's and Amagat's laws, properties of ideal gas mixtures. Psychrometric properties – Property calculations using Psychrometric chart and expression Psychrometric processes and simple applications.

TOTAL : 45 PERIODS
OUTCOMES:
Upon completion of this course, the students will be able to:

- Thermodynamic principles to Engineering Applications.
- Apply mathematical fundamentals to study the properties of steam, gas and gas mixtures.

TEXT BOOKS:

REFERENCES:
UNIT IV PUMPS

UNIT V TURBINES

TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:
• Apply mathematical knowledge to predict the properties and characteristics of a fluid.
• Critically analyse the performance of pumps and turbines.

TEXT BOOKS:

REFERENCES:

PTMA7251 NUMERICAL METHODS

OBJECTIVES:
• To provide the mathematical foundations of numerical techniques for solving linear system, eigenvalue problems, interpolation, numerical differentiation and integration and the errors associated with them;
• To demonstrate the utility of numerical techniques of ordinary and partial differential equations in solving engineering problems where analytical solutions are not readily available.

UNIT I SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS
UNIT II  INTERPOLATION AND APPROXIMATION  9
Interpolation with unequal intervals - Lagrange interpolation – Newton’s divided difference interpolation – Cubic splines - Interpolation with equal intervals - Newton’s forward and backward difference formulae – Least square method - Linear curve fitting.

UNIT III  NUMERICAL DIFFERENTIATION AND INTEGRATION  9

UNIT IV  INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS  9

UNIT V  BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS  9
Finite difference methods for solving two - point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace’s and Poisson’s equations on rectangular domain – One dimensional heat - flow equation by explicit and implicit (Crank-Nicholson) methods - One dimensional wave equation by explicit method.

TOTAL : 45 PERIODS

OUT COMES :
- Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions.
- Apply numerical methods to obtain approximate solutions to mathematical problems.
- Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
- Analyse and evaluate the accuracy of common numerical methods.

TEXT BOOKS :

REFERENCES :
OBJECTIVES:
To the study of nature and the facts about environment.
- To find and implement scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth’s interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I  ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY  14
Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.
Field study of common plants, insects, birds
Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II  ENVIRONMENTAL POLLUTION  8
Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards– soil waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.
Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III  NATURAL RESOURCES  10
Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.
Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.
UNIT IV  SOCIAL ISSUES AND THE ENVIRONMENT  

UNIT V  HUMAN POPULATION AND THE ENVIRONMENT  

TOTAL:45 PERIODS

OUTCOMES:
Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.

- Public awareness of environment at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions.
- Development and improvement in standard of living has lead to serious environmental disasters.

TEXT BOOKS:

REFERENCES:

PTME7301  KINEMATICS OF MACHINES  
OBJECTIVES:
- To understand the basic components and layout of linkages in the assembly of a system/machine.
- To understand the principles in analysing the assembly with respect to the displacement, velocity, and acceleration at any point in a link of a mechanism.
- To understand the motion resulting from a specified set of linkages, design few linkage mechanisms and cam mechanisms for specified output motions.
- To understand the basic concepts of toothed gearing and kinematics of gear trains.
UNIT I  BASIC CONCEPTS

UNIT II  MECHANISMS
Classification of mechanisms- Ratchets and Escapement mechanisms- Indexing mechanisms- Analysis of Hooke’s joint – Double Hooke’s joint- Pantograph – Straight line motion Mechanisms (Exact and Approximate)- Steering gear mechanisms.

UNIT III  KINEMATICS OF LINKAGE MECHANISMS
Displacement, velocity and acceleration analysis of mechanisms – Velocities and accelerations by relative velocity method -Velocity analysis using instantaneous centre method- Velocities and accelerations by Analytical method -Coriolis Acceleration.

UNIT IV  KINEMATICS OF CAM MECHANISMS

UNIT V  GEARS AND GEAR TRAINS

TOTAL:45 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:
• Apply the fundamentals of mechanisms and analyze new mechanisms.

TEXT BOOKS:

REFERENCES:
OBJECTIVE:
- To introduce the students to the concepts of basic manufacturing processes and fabrication techniques, such as metal casting, metal joining, metal forming and manufacture of plastic components.

UNIT I  METAL CASTING PROCESSES

UNIT II  METAL JOINING PROCESSES

UNIT III  BULK DEFORMATION PROCESSES

UNIT IV  SHEET METAL PROCESSES

UNIT V  MANUFACTURE OF PLASTIC COMPONENTS

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to apply the different manufacturing process and use this in industry for component production.
TEXT BOOKS:

REFERENCES:

PTCE7304  STRENGTH OF MATERIALS  L  T  P  C
3  0  0  3

OBJECTIVE:
- To understand the stresses developed in bars, compounds bars, beams, shafts, cylinders and spheres.

UNIT I  STRESS, STRAIN AND DEFORMATION OF SOLIDS

UNIT II  TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM

UNIT III  TORSION
Torsion formulation stresses and deformation in circular and hollows shafts – Stepped shafts – Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs, carriage springs.

UNIT IV  DEFLECTION OF BEAMS
Double Integration method – Macaulay’s method – Area moment Theorems for computation of slopes and deflections in beams - Conjugate beam and strain energy – Maxwell’s reciprocal theorems.
UNIT V THIN CYLINDERS, SPHERES AND THICK CYLINDERS
Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses and deformation in thin cylinders – spherical shells subjected to internal pressure – Deformation in spherical shells – Lame’s theory – Application of theories of failure.

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to apply mathematical knowledge to calculate the deformation behavior of simple structures.
- Critically analyse problem and solve the problems related to mechanical elements and analyse the deformation behavior for different types of loads.

TEXT BOOKS:

REFERENCES:

PTME7303 THERMAL ENGINEERING - I

OBJECTIVES:
- To apply the concepts and laws of thermodynamics for cycle analysis and performance of heat engines - Internal Combustion(IC) engines and Gas Turbines.
- To get an insight on the working and performance of air compressors
- To understand the working of various auxiliary systems present in IC engines.

UNIT I GAS AND STEAM POWER CYCLES

UNIT II RECIPROCATING AIR COMPRESSOR
UNIT III INTERNAL COMBUSTION ENGINES AND COMBUSTION 9

UNIT IV INTERNAL COMBUSTION ENGINE PERFORMANCE AND SYSTEMS 9

UNIT V GAS TURBINES 9

OUTCOMES:
Upon completion of this course, the students will be able to:
- Analyse the theory and performance of air-standard cycles
- Understand functioning and performance of IC engines and its sub systems
- Understand the working of Gas turbines and their performance

TEXT BOOKS:

REFERENCES:
UNIT II BALANCING 9

UNIT III FREE VIBRATION 9

UNIT IV FORCED VIBRATION 9

UNIT V MECHANISMS FOR CONTROL 9

OUTCOME:
Upon completion of this course, the students will be able to:
  • Analyse the forces acting in a mechanical system and related vibration issues.

TEXT BOOKS:

REFERENCES:
**OBJECTIVES:**

- To impart knowledge on construction of phase diagrams and also the importance of iron-iron carbide phase diagram.
- To impart knowledge on different heat treatment processes used in industries and the basics behind the microstructure formation.
- To impart knowledge on the properties and applications of various engineering materials.
- To expose testing methods and procedures to find the mechanical properties of engineering materials.

**UNIT I CONSTITUTION OF ALLOYS AND PHASE DIAGRAMS**


**UNIT II HEAT TREATMENT**


**UNIT III FERROUS AND NON-FERROUS METALS**


**UNIT IV NON-METALLIC MATERIALS**


**UNIT V MECHANICAL PROPERTIES AND DEFORMATION MECHANISMS**


**OUTCOMES:**

Upon completion of this course, the students will be able to:

- Understand the phase diagrams and relate to the heat treatment processes.
- Tailor structure-property correlations to engineering materials.
- Select proper engineering materials for various engineering applications.
- Perform various testing’s to find the properties of engineering materials.
TEXT BOOKS:

REFERENCES:

PTME7402 MANUFACTURING TECHNOLOGY – II

OBJECTIVES:
- To understand the concept and basic mechanics of metal cutting, working of standard machine tools such as lathe, shaping and allied machines, milling, drilling and allied machines, grinding and allied machines and broaching.
- To understand the basic concepts of Computer Numerical Control (CNC) of machine tools and CNC Programming.

UNIT I THEORY OF METAL CUTTING 9
Mechanics of chip formation, single point cutting tool, forces in machining, Types of chip, cutting tools – nomenclature, orthogonal, oblique metal cutting, thermal aspects, cutting tool materials, tool wear, tool life, surface finish, cutting fluids and Machinability.

UNIT II TURNING MACHINES 9

UNIT III RECIPROCATING, MILLING AND GEAR CUTTING MACHINES 9
Reciprocating machine tools: shaper, planer, slotter: Types and operations- Hole making: Drilling, reaming, boring, tapping, type of milling operations-attachments- types of milling cutter—machining time calculations - Gear cutting, gear hobbing and gear shaping – gear finishing methods.

UNIT IV ABRASIVE PROCESSES AND BROACHING 9

UNIT V COMPUTER NUMERICAL CONTROL MACHINE TOOLS 9
Numerical Control (NC) machine tools – CNC types, constructional details, special features, machining centre and part programming fundamentals – manual part programming and computer assisted part programming.

TOTAL: 45 PERIODS
OUTCOME:
Upon completion of this course, the students will be able to:
- Understand and compare the functions and applications of different metal cutting operations, machine tools and gain knowledge in programming of CNC machines.

TEXT BOOKS:

REFERENCES:

PTME7403 THERMAL ENGINEERING - II

OBJECTIVES:
- To apply the thermodynamic concepts for systems like Nozzles, Boilers, Turbines, and Refrigeration & Air Conditioning Systems.
- To understand the concept of utilising residual heat in thermal systems.

UNIT I STEAM NOZZLE
Types and Shapes of nozzles, Flow of steam through nozzles, Critical pressure ratio, Variation of mass flow rate with pressure ratio. Effect of friction. Metastable flow.

UNIT II BOILERS

UNIT III STEAM TURBINES
Types, Impulse and reaction principles, Velocity diagrams, Work done and efficiency – optimal operating conditions. Multi-staging, compounding and governing.

UNIT IV COGENERATION AND RESIDUAL HEAT RECOVERY
UNIT V  REFRIGERATION AND AIR – CONDITIONING


TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:

- Understand the working of Nozzles, Boilers & Steam Turbines and their performance
- Understand cogeneration, its types, source of residual heat and their utilising techniques
- Understand the working of Refrigeration & Air-conditioning systems and perform cooling load calculations to determine heating loads

TEXT BOOKS:

REFERENCES:

PTME7411 THERMAL ENGINEERING LABORATORY L T P C
0 0 3 2

OBJECTIVES:
To understand the working of a thermal equipments like IC engines, compressor, and refrigeration

IC ENGINES LAB
1. Valve timing on a four stroke SI and CI engine
2. Port Timing of a Two stroke SI engine
3. Performance test on a CI engine with electrical loading
4. Performance test on a SI engine with electrical loading
5. Performance Test on a Multi-stage Reciprocating Air Compressor

HEAT TRANSFER LAB:
1. Determination of Thermal conductivity of a composite wall
2. Effectiveness of Parallel / counter flow heat exchanger
3. Determination of heat transfer coefficient under natural convection from a vertical cylinder.
4. Determination of heat transfer coefficient under forced convection from a tube.
5. Heat transfer from pin-fin apparatus (natural & forced convection modes)
6. Determination of COP of a vapour compression refrigeration system

TOTAL: 30 PERIODS
OBJECTIVES:
- To understand fundamental concepts of computer graphics and its tools in a generic framework.
- To provide clear understanding of CAD systems for 3D modeling and viewing.

UNIT I  FUNDAMENTALS OF COMPUTER GRAPHICS
Product cycle- Design process - Computer Aided Design – Computer graphics – co-ordinate systems- 2D and 3D transformations- homogeneous coordinates - graphic primitives (point, line, circle drawing algorithms) - Clipping- viewing transformation.

UNIT II  GEOMETRIC MODELING
Representation of curves - Hermite cubic spline curve, Bezier curve, B-spline curves, Surface Modeling – Surface Entities, Representation of Surface, Bezier Surface, B-Spline Surface and Coons Surface. Solid Modeling - Solid Entities, Solid Representation, Boundary Representation (B-Rep), Sweeps Representation, Constructive Solid Geometry (CSG).

UNIT III  VISUAL REALISM

UNIT IV  PART ASSEMBLY
Mass properties - Assembly modeling – Inference of position and orientation –Geometric Dimensioning and Tolerancing – Functional importance of various types of fits, Geometrical dimensioning and Tolerancing, Tolerance stacking – types and remedies.

UNIT V  CAD STANDARDS
Standards for computer graphics- Graphical Kernel System (GKS) - Open Graphics Library (OpenGL) - Data exchange standards - IGES, STEP, ACIS and DXF - communication standards.

TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:
- Understand the various stages in the design process and the role of computer graphic communication process.
- Understand the mathematics behind the use of computer for modeling of mechanical components

TEXT BOOK:

REFERENCES:
OBJECTIVE:
- To understand the application of computers in various aspects of Manufacturing viz., Design, Planning, Manufacturing cost, Layout & Material Handling system.

UNIT I  INTRODUCTION  9

UNIT II  PRODUCTION PLANNING & CONTROL AND COMPUTERISED PROCESS PLANNING  9

UNIT III  CELLULAR MANUFACTURING  9

UNIT IV  FLEXIBLE MANUFACTURING SYSTEM (FMS) AND AUTOMATED GUIDED VEHICLE SYSTEM (AGVS)  9

UNIT V  INDUSTRIAL ROBOTICS  9

OUTCOME:
Upon completion of this course, the students will be able to:
- Acquire the required capability to gradually convert Traditional Manufacturing environment to Computer Integrated Manufacturing environment.

TEXT BOOK:
REFERENCES:

PTME7503 DESIGN OF MACHINE ELEMENTS

OBJECTIVES
• To familiarize the various steps involved in the Design Process
• To understand the principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements.
• To learn to use standard practices and standard data
• To learn to use catalogues and standard machine components

UNIT I STEADY STRESSES AND VARIABLE STRESSES IN MACHINE MEMBERS
Introduction to the design process - factors influencing machine design, selection of materials based on mechanical properties – Stresses in members subjected to axial, shear, Bending, Torsional & Eccentric loading. Uniaxial, Biaxial & Triaxial stress state, Principal Stresses in members subjected to combination of static loads.
Theories of Failure Criterion - Types of variable/Cyclic loads, Fatigue Failure, Endurance Limit & Strength, S-N Diagram. Goodman and Soderberg criterion, Modifying factors: Size effect, surface effect, Reliability, stress concentration effects etc.

UNIT II CURVED BEAMS, SHAFTS AND COUPLINGS
Differences between Straight & curved beam, Stresses in curved Beams subjected to Direct and Bending loading of Standard cross sections (Circular, Rectangular, Trapezium, Triangle, I & T Sections) used in crane hook, punching presses & clamps, Closed rings & chain links

Types of shafts- Design of solid & hollow shaft on strength and rigidity basis - Design of shafts carrying pulleys & gears (Combined loading). ASME Code for shaft design.
Types of couplings -Design of muff and flange couplings.

UNIT III TEMPORARY AND PERMANENT JOINTS
Design of Bolted and riveted joints for structures including eccentric loading- Design of Welded joints, Strength of Butt, parallel, transverse welds, eccentrically loaded welded joint subjected to torsion & bending moment.

UNIT IV ENERGY STORING ELEMENTS
Types and materials of Springs, Terms used in Compression Springs, Stresses in helical spring of circular wire, deflection of helical spring of circular wire, Energy stored in helical spring of circular wire, helical spring subjected to fatigue loading, spring, leaf spring, construction of leaf spring, equalized stresses in spring leaves, length of leaf spring leaves - Flywheels considering stresses in rims and arms for engines and punching machines.
UNIT V BEARINGS

Rolling contact bearings :Types & classification, Terminology-Life, Static & dynamic load capacity, equivalent load, Load-life relationship, Design –finding Life, selection from manufacturer’s catalogue

TOTAL: 45 PERIODS

Note: (Use of P S G Design Data Book is permitted in the University examination)

OUTCOMES:
Upon completion of this course, the students can able to successfully design machine components

TEXT BOOK:

REFERENCES:

STANDARDS:
1. IS 10260 : Part 1 : 1982 Terms, definitions and classification of Plain bearings Part 1 :
2. Construction.
   IS 10260 : Part 1 : 1982 Terms, definitions and classification of Plain bearings Part 2 :
   Friction and Wear.
3. IS 10260 : Part 1 : 1982 Terms, definitions and classification of Plain bearings Part 3 :
   Lubrication.

OBJECTIVES:
- To introduce the concepts of Mathematical Modeling and numerical solution of engineering problems.
- To appreciate the use of Finite Element Method to a range of engineering problems.

UNIT I INTRODUCTION

UNIT II  ONE-DIMENSIONAL PROBLEMS  

UNIT III  TWO DIMENSIONAL SCALAR VARIABLE PROBLEMS  

UNIT IV  TWO DIMENSIONAL VECTOR VARIABLE PROBLEMS  

UNIT V  ISOPARAMETRIC FORMULATION AND ADVANCED TOPICS  

TOTAL:45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:
- Understand the use of the FEM to solve problems in Mechanical Engineering.
- Use the Finite Element Method to solve Structural, thermal and Eigen value problems.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To provide student with knowledge on the application of fluid power in process, construction and manufacturing industries.
- To provide students with an understanding of the fluids and components utilized in modern industrial fluid power system.
- To develop a measurable degree of competence in the design, construction and operation of fluid power circuits.

UNIT I FLUID POWER PRINCIPLES AND HYDRAULIC PUMPS

UNIT II HYDRAULIC ACTUATORS AND CONTROL COMPONENTS

UNIT III HYDRAULIC CIRCUITS AND SYSTEMS
Accumulators, Intensifiers, Industrial hydraulic circuits – Regenerative, Pump Unloading, Double-Pump, Pressure Intensifier, Air-over oil, Sequence, Reciprocation, Synchronization, Fail-Safe, Speed Control, Hydrostatic transmission, Electro hydraulic circuits, Mechanical hydraulic servo systems.

UNIT IV PNEUMATIC AND ELECTRO PNEUMATIC SYSTEMS

UNIT V TROUBLE SHOOTING AND APPLICATIONS

TOTAL:45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:
- Identify hydraulic and pneumatic components and its symbol and usage.
- Ability to design hydraulic and pneumatic circuits.

TEXT BOOKS:
REFERENCES:

PTME7601 DESIGN OF TRANSMISSION SYSTEMS

OBJECTIVES
- To gain knowledge on the principles and procedures for the design of mechanical power transmission components.
- To understand the standard procedures available for design of transmission elements.

UNIT I DESIGN OF FLEXIBLE ELEMENTS
Design of Flat belts and pulleys - Selection of V belts and sheaves – Selection of wire ropes and pulleys – Design of Transmission chains and Sprockets.

UNIT II SPUR AND HELICAL GEARS
Gear materials - Design of straight tooth spur & helical gears based on speed ratios, number of teeth, Fatigue strength, Factor of safety, strength and wear considerations. Force analysis -Tooth stresses - Dynamic effects - Helical gears – Module - normal and transverse, Equivalent number of teeth - forces.

UNIT III BEVEL AND WORM GEARS
Straight bevel gear: Gear materials - Tooth terminology, tooth forces and stresses, equivalent number of teeth, estimation of dimensions of straight bevel gears.
Worm Gear: Gear materials - Tooth terminology, Thermal capacity, forces and stresses, efficiency, estimation of dimensions of worm gear pair.

UNIT IV GEAR BOXES

UNIT V CLUTCHES, BRAKES AND CAMS
Design of single and multi plate clutches, cone clutches, internal expanding rim clutches. Design of brakes: External shoe brakes - Single and Double Shoe, Internal expanding shoe brakes. Design of Cams: Types- Pressure angle and under cutting, determination of base circle -forces and surface stresses.

TOTAL:45 PERIODS

Note: (Use of standard Design Data Book is permitted in the University examination)
OUTCOMES:
Upon completion of this course, the students will be able to:
- Appreciate the functions of various transmission elements and their assemblies
- Design different transmission components according to the requirement as per standards using data books.

TEXT BOOKS:

REFERENCES:

PTME7602 HEAT AND MASS TRANSFER L T P C
3 0 0 3

OBJECTIVES:
- To understand the mechanisms of heat transfer under steady and transient conditions.
- To understand the concepts of heat transfer through extended surfaces.
- To learn the thermal analysis and sizing of heat exchangers and to understand the basic concepts of mass transfer.

UNIT I CONDUCTION

UNIT II CONVECTION
UNIT III PHASE CHANGE HEAT TRANSFER AND HEAT EXCHANGERS 9
Nusselt’s theory of condensation- Regimes of Pool boiling, correlations in boiling and condensation.
LMTD and NTU methods.

UNIT IV RADIATION 9

UNIT V MASS TRANSFER 9

OUTCOME:
Upon completion of this course, the students will be able to:
• Understand and apply different heat and mass transfer principles of different applications.

TEXT BOOKS:

REFERENCES:

PTME7603 METROLOGY AND MEASUREMENTS L T P C
3 0 0 3

OBJECTIVE:
• To expose the science behind the measurements and their applications in manufacturing industries in quality control.

UNIT I BASICS OF METROLOGY 9
UNIT II
LINEAR AND ANGULAR MEASUREMENTS

UNIT III
METROLOGY OF SURFACES

UNIT IV
METROLOGY OF ASSEMBLY AND TRANSMISSION ELEMENTS

UNIT V
ADVANCES IN METROLOGY

OUTCOME:
Upon completion of this course, the students will be able to:
• Make logical, rational and economical choice of measuring equipment / method to analyse and improve manufacturing processes.

TEXT BOOKS:

REFERENCES:
9. NPL Measurement good practice guides relevant to the syllabus – No. 40, No. 41, No. 42, No. 43, No. 80, No. 118, No. 130, No. 131.
OBJECTIVES:

- To give exposure to software tools needed to analyze engineering problems.
- To expose the students to different applications of simulation and analysis tools.

UNIT I SIMULATION

LIST OF EXPERIMENTS

1. MANUAL PART PROGRAMMING:
   (i) Part Programming - CNC Machining Centre
      a) Linear Cutting.
      b) Circular cutting.
      c) Cutter Radius Compensation.
      d) Canned Cycle Operations.
   (ii) Part Programming - CNC Turning Centre
      a) Straight, Taper and Radius Turning.
      b) Thread Cutting.
      c) Rough and Finish Turning Cycle.
      d) Drilling and Tapping Cycle.

2. COMPUTER AIDED PART PROGRAMMING
   e) CL Data and Post process generation using CAM packages.
   f) Application of CAPP in Machining and Turning Centre.

3. STUDY OF CNC EDM, CNC EDM WIRE-CUT AND RAPID PROTOTYPING.

UNIT II ANALYSES

LIST OF EXPERIMENTS

Use of any finite element analysis software for following problems:
1. Force and Stress analysis using link elements in Trusses, cables and bars.
2. Stress and deflection analysis in beams with different support conditions.
3. Stress analysis of flat plates and simple shells.
5. Thermal stress and heat transfer analysis of fins, plates and cylinders.
6. Vibration analysis of spring-mass systems.
7. Modal analysis of Beams.
8. Harmonic, transient and spectrum analysis of simple systems

TOTAL:45 PERIODS

OUTCOME:

Upon completion of this course, the students will be able to:
- Understand the use of analysis and simulation software to solve problems in Mechanical Engineering.
OBJECTIVE:

- To impart knowledge about the elements and techniques involved in Mechatronics systems in understanding the concept of automation.

UNIT I  INTRODUCTION

UNIT II  8085 MICROPROCESSOR

UNIT III  PROGRAMMABLE PERIPHERAL INTERFACE

UNIT IV  PROGRAMMABLE LOGIC CONTROLLER
Introduction – Architecture – Input / Output Processing – Programming with Timers, Counters and Internal relays – Data Handling – Selection of PLC.

UNIT V  ACTUATORS AND MECHATRONICS SYSTEM DESIGN

TOTAL:45 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:

- Design Mechatronics systems with the help of Microprocessor, PLC and other Electrical and Electronics Circuits.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- To understand the working of power plants and analyse their performance.
- To learn the economics of power generation.

UNIT I  HYDRO POWER PLANTS

UNIT II  COAL, OIL AND GAS TURBINE POWER PLANTS

UNIT III  NUCLEAR POWER PLANTS

UNIT IV  RENEWABLE ENERGY POWER PLANTS

UNIT V  ECONOMICS OF POWER GENERATION

OUTCOMES:
Upon completion of this course the students will be able to:

- Understand the working of different power plants
- Arrive at cost of power generation, electricity billing and rate of return on power plant investments

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same.
- To train the students in preparing project reports and to face reviews and viva voce examination.
- A project topic must be selected by the students in consultation with their guides.
- The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design and fabrication of a device for a specific application, a research project with a focus on an application needed by the industry/society, a computer project, a management project or a design project.
- The progress of the project is evaluated based on a minimum of three reviews.
- The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated jointly by external and internal examiners constituted by the Head of the Department based on oral presentation and the project report.

TOTAL: 135 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:
- Take up any challenging practical problems and find solution by formulating proper methodology.

OBJECTIVES:
- To know the principle, methods, possibilities and limitations as well as environmental effects of Additive Manufacturing technologies.
- To be familiar with the characteristics of the different materials those are used in Additive Manufacturing technologies.

UNIT I INTRODUCTION

UNIT II DESIGN FOR ADDITIVE MANUFACTURING
UNIT III PHOTO POLYMERIZATION AND POWDER BED FUSION PROCESSES


UNIT IV EXTRUSION BASED AND SHEET LAMINATION PROCESSES


UNIT V PRINTING PROCESSES AND BEAM DEPOSITION PROCESSES


TOTAL: 45 PERIODS

OUTCOME:

- On completion of this course, students will learn about a working principle and construction of Additive Manufacturing technologies, their potential to support design and manufacturing, modern development in additive manufacturing process and case studies relevant to mass customized manufacturing.

TEXT BOOKS:


REFERENCES:


PTME7001 ADVANCED INTERNAL COMBUSTION ENGINEERING

OBJECTIVES:

- To understand the principles of operation of different IC Engines, combustion process and fuel injection systems.
- To provide knowledge on pollutant formation and control, suitability of alternate fuels, and recent technological advances.

UNIT I SPARK IGNITION ENGINES

UNIT II  COMPRESSION IGNITION ENGINES  9

UNIT III  POLLUTANT FORMATION AND CONTROL  9

UNIT IV  ALTERNATIVE FUELS  9
Alcohol, Hydrogen, Compressed Natural Gas, Liquefied Petroleum Gas and Bio Diesel - Properties, Suitability, Merits and Demerits - Engine Modifications.

UNIT V  RECENT TRENDS  9

TOTAL:45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to
- Understand the combustion process, and the fuel injection techniques adopted in modern day IC engines
- Adopt potential alternative fuel systems and exposed to recent developments in engine technology.

TEXT BOOKS:

REFERENCES:
OBJECTIVE:
- To provide a first course of teaching such that the learners are able to visualise the scope of Automobile Engineering.

UNIT I INTRODUCTION TO AUTOMOTIVES
An overview of different types of automobiles and their power sources. Specifications, Performance Parameters, Quality standards, Trends in automobile design.

UNIT II POWER SOURCE FEATURES
Reciprocating Engine systems, Rotary Engine systems, Gas Turbine systems, Hybrid systems. Pollutant emissions and their control; Catalytic converter systems, Electronic Engine Management systems.

UNIT III TRANSMISSION, SUSPENSION AND BRAKING SYSTEMS
Clutch system, Gear box system, propeller shafting, differential, axles, wheels and tyres and preliminaries of suspension systems.

UNIT IV AUXILIARY SYSTEMS
Electrical and electronic systems, safety systems, Heating, Ventilation, and Air Conditioning (HVAC) systems, Vehicle Thermal Management System and vehicle body design features.

UNIT V TESTS, SERVICE AND MAINTENANCE
Engine Tuning, vehicle maintenance, engine and Chassis Dynamometry Pollutants and emissions check, Wind Tunnel Tests, preliminaries of engine and vehicle testing.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:
- Identify the different components in an automobile.
- Clearly understand different auxiliary and transmission systems.

TEXT BOOK:

REFERENCES:
PTME7003  CASTING AND WELDING PROCESSES  L  T  P  C
3 0 0 3

OBJECTIVE:
- To impart knowledge on Design of Gating system for Castings, Foundry Practice of Ferrous, Non Ferrous alloys, Foundry Mechanisation, Welding Processes and Welding Metallurgy.

UNIT I  DESIGN OF GATING SYSTEM

UNIT II  FERROUS AND NON FERROUS CASTINGS
Steel Casting – The family of cast iron – melting of steels and cast irons – Grey iron foundry practice – Ductile iron – Malleable Iron casting design – Aluminium, Magnesium, Copper, Zinc, Duplex Stainless Steel and Titanium alloys foundry practice.

UNIT III  FOUNDRY MECHANISATION
Mechanical equipments in foundry – plant site location, layout – Plant Engineering – Maintenance – Services – Practical aspects.

UNIT IV  WELDING PROCESS AND TECHNOLOGY

UNIT V  WELDING METALLURGY

TOTAL:45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:
- Design gating system for castings, understand the foundry practices of ferrous and non ferrous metals.
- Understand the various aspects of foundry mechanization, welding metallurgy and certain welding processes.

TEXT BOOK:

REFERENCES:
OBJECTIVES:
To understand:
- The fundamentals of composite material strength and its mechanical behavior
- Fibre reinforced Laminate design for different combinations of plies with different orientations of the fibre.
- Thermo-mechanical behavior and study of residual stresses in Laminates during processing.
- Implementation of Classical Lamine Theory (CLT) and analysis for residual stresses in an isotopic layered structure such as electronic chips.

UNIT I  INTRODUCTION TO COMPOSITE MATERIALS  9

UNIT II  MANUFACTURING OF COMPOSITES  9
Manufacturing of Polymer Matrix Composites (PMCs)-handlay-up, spray technique, filament winding, Pultrusion, Resin Transfer Moulding (RTM)-, bag moulding, injection moulding, Sandwich Mould Composites (SMC) - Manufacturing of Metal Matrix Composites (MMCs) - Solid state, liquid state, vapour state processing, Manufacturing of Ceramic Matrix Composites (CMCs) –hot pressing-reaction bonding process-infiltration technique, direct oxidation- interfaces.

UNIT III  INTRODUCTION, LAMINA CONSTITUTIVE EQUATIONS  9

UNIT IV  LAMINA STRENGTH ANALYSIS AND ANALYSIS OF LAMINATED FLAT PLATES  9

UNIT V  THERMAL ANALYSIS  9

TOTAL:45 PERIODS
OUTCOME:
- The students will be able to understand the mechanics and design related to layered components such as fiber reinforced polymer composites, isotropic layered structures (example electronic chips) etc and its manufacturing methodologies.

TEXT BOOKS:

REFERENCES:

PTME7005 COMPUTATIONAL TECHNIQUES FOR FLUID DYNAMICS L T P C
3 0 0 3

OBJECTIVES:
- To enable the students to understand the various discretization methods, solution procedures and turbulence modeling.
- To create confidence in solving complex problems in the field of fluid flow and heat transfer by using high speed computers.

UNIT I GOVERNING EQUATIONS AND BOUNDARY CONDITIONS 9

UNIT II FINITE DIFFERENCE AND FINITE VOLUME METHODS FOR DIFFUSION 9
UNIT III FINITE VOLUME METHOD FOR CONVECTION DIFFUSION

Steady one-dimensional convection and diffusion – Central, upwind differencing schemes properties of discretization schemes – Conservativeness, Boundedness, Transportiveness, Hybrid, Power-law, QUICK Schemes.

UNIT IV FLOW FIELD ANALYSIS


UNIT V TURBULENCE MODELS AND MESH GENERATION


TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:

- Create numerical models and their role in the field of fluid flow and heat transfer
- Use the various discretization methods, solution procedures and turbulence models to solve flow and heat transfer problems.

TEXT BOOKS:

REFERENCES:
OBJECTIVE:
- To understand the design constraints in manufacturing and assembly operations.

UNIT I  INTRODUCTION AND CASTING  9
Introduction - Economics of process selection - General design principles for manufacturability; Design considerations for: Sand cast – Die cast – Permanent mold cast parts.

UNIT II  FORMING  9
Design considerations for: Metal extruded parts – Impact/Cold extruded parts – Stamped parts – Forged parts.

UNIT III  WELDING  9

UNIT IV  MACHINING  9
Design considerations for: Turned parts – Drilled parts – Milled, planed, shaped and slotted parts – Ground parts.

UNIT V  ASSEMBLY  9

OUTCOME:
Upon completion of this course, the students will be able to:
- Gain technical competency in design modification of components / products with respect to manufacturability.

TEXT BOOK:

REFERENCES:
OBJECTIVES:
- To learn thermal and stress analysis on various parts of the heat exchangers
- To analyze the sizing and rating of the heat exchangers for various applications.

UNIT I  INTRODUCTION
Types of heat exchangers, shell and tube heat exchangers – regenerators and recuperators - Temperature distribution and its implications - Parts description, Classification as per Tubular Exchanger Manufacturers Association (TEMA).

UNIT II  PROCESS DESIGN OF HEAT EXCHANGERS

UNIT III  STRESS ANALYSIS
Stress in tubes – header sheets and pressure vessels – thermal stresses, shear stresses - types of failures, buckling of tubes, flow induced vibration.

UNIT IV  COMPACT AND PLATE HEAT EXCHANGER
Types- Merits and Demerits- Design of compact heat exchangers, plate heat exchangers, performance influencing parameters, limitations.

UNIT V  CONDENSERS AND COOLING TOWERS
Design of surface and evaporative condensers – cooling tower – performance characteristics.

TOTAL: 45 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:
- Apply the mathematical knowledge for thermal and stress analysis of various parts of the heat exchangers components.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To understand the importance, functions and design principles of Jigs, fixtures and press tools
- To gain proficiency in the development of standard views of the final design.

UNIT I  PRINCIPLES OF JIGS, FIXTURES AND PRESS WORKING  9
Objectives and importance of tool design—work holding devices- Basic elements of jigs and fixtures- location – clamping-indexing-operational chart-Fits and Tolerances

UNIT II  JIGS  9
Design and development of jigs for given component - Types of Jigs – Post, Turnover, Channel, latch, box, pot, angular post jigs – Indexing jigs.

UNIT III  FIXTURES  9
Design and development of fixtures for given component- General principles of milling, Lathe, boring, broaching and grinding fixtures – Assembly, Inspection and Welding fixtures – Modular fixturing systems- Quick change fixtures.

UNIT IV  DESIGN OF CUTTING DIES  9
Complete design and preparation of standard views of simple blanking, piercing, compound and progressive dies -fine Blanking dies.

UNIT V  DESIGN OF BENDING, FORMING, DRAWING AND MISCELLANEOUS  9 DIES

TOTAL:45 PERIODS

Note: (Use of P S G Design Data Book is permitted in the University examination)

OUTCOMES:
Upon completion of this course, the students will be able to:
- Design jigs, fixtures and press tools and give the assembly drawing with dimensions and Parts list.
- Use the above knowledge to design various types of dies and give the standard dimensioned views

TEXT BOOKS:
REFERENCES:

PTME7009 DESIGN OF PRESSURE VESSELS AND PIPING

OBJECTIVES:
- To apply the Mathematical knowledge gained in the design of pressure vessels and piping
- To carry out the stress analysis in pressure vessels and piping.

UNIT I INTRODUCTION

UNIT II STRESSES IN PRESSURE VESSELS

UNIT III DESIGN OF VESSELS
Design of Tall cylindrical self supporting process columns – Supports for short vertical vessels – Stress concentration at a variable Thickness transition section in a cylindrical vessel, about a circular hole, elliptical openings. Theory of Reinforcement – Pressure Vessel Design.

UNIT IV BUCKLING AND FRACTURE ANALYSIS IN VESSELS
Buckling phenomenon – Elastic Buckling of circular ring and cylinders under external pressure – collapse of thick walled cylinders or tubes under external pressure – Effect of supports on Elastic Buckling of Cylinders – Buckling under combined External pressure and axial loading.

UNIT V PIPING

OUTCOMES:
Upon completion of this course, the students will be able to:
- Apply the mathematical fundamentals for the design of pressure vessels and pipes.
- Analyse and design pressure vessels and piping.

TEXT BOOK:
OBJECTIVES:

- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction.
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR).
- To enhance awareness of institutional processes in the country.
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity.

UNIT I   INTRODUCTION TO DISASTERS

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don’ts during various types of Disasters.

UNIT II   APPROACHES TO DISASTER RISK REDUCTION (DRR)

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies

UNIT III   INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources

UNIT IV   DISASTER RISK MANAGEMENT IN INDIA

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.
UNIT V  DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS

OUTCOMES:
The students will be able to
- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarios in the Indian context,
- Disaster damage assessment and management.

TEXT BOOKS:

REFERENCES:
1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005

PTME7010  ENERGY CONSERVATION IN INDUSTRIES  L  T  P  C
3  0  0  3

OBJECTIVES:
- To understand and analyse the energy data of industries.
- To carryout energy accounting and balancing.
- To conduct energy audit and suggest methodologies for energy savings.
- To utilise the available resources in optimal ways.

UNIT I  INTRODUCTION

UNIT II  ECONOMICS
UNIT III  ELECTRICAL SYSTEMS  9

UNIT IV  THERMAL SYSTEMS  9

UNIT V  ENERGY CONSERVATION IN MAJOR UTILITIES  9
Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems - Cooling Towers – D.G. sets

OUTCOMES:
Upon completion of this course, the students will be able to:
- Analyse the energy data of industries.
- Carry out energy accounting and balancing.
- Suggest methodologies for energy savings.

TEXT BOOK:

REFERENCES:

PTGE7072  ENGINEERING ETHICS AND HUMAN VALUES  L T P C
3 0 0 3

OBJECTIVES
- To emphasise into awareness on Engineering Ethics and Human Values.
- To understand social responsibility of an engineer.
- To appreciate ethical dilemma while discharging duties in professional life.

UNIT I  HUMAN VALUES  3

UNIT II  ENGINEERING ETHICS  9
UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as experimentation - engineers as responsible experimenters - codes of ethics – Importance of Industrial Standards - a balanced outlook on law – anticorruption- occupational crime - the challenger case study.

UNIT IV ENGINEER’S RIGHTS AND RESPONSIBILITIES ON SAFETY


UNIT V GLOBAL ISSUES

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors - moral leadership- Sample code of conduct.

TOTAL : 45 PERIODS

OUTCOMES

- Students will have the ability to perform with professionalism, understand their rights, legal, ethical issues and their responsibilities as it pertains to engineering profession with engaging in life-long learning with knowledge of contemporary issues.

TEXT BOOKS:


REFERENCES:


OBJECTIVE:
- The students will be provided with an understanding of the scope of an entrepreneur, key areas of development, financial assistance by the institutions, methods of taxation and tax benefits, etc.

UNIT I ENTREPRENEURSHIP

UNIT II MOTIVATION

UNIT III BUSINESS

UNIT IV FINANCING AND ACCOUNTING

UNIT V SUPPORT TO ENTREPRENEURS

TOTAL: 45 PERIODS

OUTCOME:
Upon completion of the course, the students will be able to:
- Gain knowledge and skills needed to run a business successfully.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To learn about basis of nanomaterial science, preparation method, types and application

UNIT I  INTRODUCTION  8
Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II  GENERAL METHODS OF PREPARATION  9
Bottom-up Synthesis-Top-down Approach: Co-Precipitation, Ultrasonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III  NANOMATERIALS  12
Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube, 92 Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)- methods of synthesis(arc-growth, laser ablation, CVD routes, Plasma CVD), structure-property Relationships applications- Nanometal oxides-ZnO, TiO$_2$, MgO, ZrO$_2$, NiO, nanoalumina, CaO, AgTiO$_2$, Ferrites, Nanoclays-functionization and applications-Quantum wires, Quantum dotspreparation, properties and applications

UNIT IV  CHARACTERIZATION TECHNIQUES  9
X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation

UNIT V  APPLICATIONS  7

TOTAL : 45 PERIODS

OUTCOMES:
Upon completing this course, the students
- Will familiarize about the science of nanomaterials
- Will demonstrate the preparation of nanomaterials
- Will develop knowledge in characteristic nanomaterial

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- To understand the fundamentals of compressible flow in constant and variable area ducts.
- To understand the behaviour of shock waves and its effect on flow.
- To gain basic knowledge about Jet and Rocket propulsion.

UNIT I BASIC CONCEPTS AND ISENTROPIC FLOWS


UNIT II FLOW THROUGH DUCTS

Flows through constant area ducts with heat transfer (Rayleigh flow) and Friction (Fanno flow) – variation of flow properties. Choking concept, Isothermal flow with friction. Use of Gas tables.

UNIT III NORMAL AND OBLIQUE SHOCKS


UNIT IV JET PROPULSION

Theory of jet propulsion – thrust equation – Performance parameters - thrust, power and efficiency. Operation, cycle analysis and performance of ram jet, turbojet, turbofan, turbo prop and pulse jet engines.

UNIT V SPACE PROPULSION


OUTCOME:
Upon completion of this course, the students will be able to:
- Apply the principles of gas dynamics in Jet and Space Propulsion.

TEXT BOOKS:

REFERENCES:
OBJECTIVES :
- To sensitize the Engineering students to various aspects of Human Rights.

UNIT I

UNIT II

UNIT III
Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV
Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V

TOTAL : 45 PERIODS

OUTCOME :
- Engineering students will acquire the basic knowledge of human rights.

REFERENCES:
OBJECTIVE:

- To introduce the concepts in optimization of resources for manufacturing and service based industries.

UNIT I  LINEAR PROGRAMMING PROBLEMS  9
OR-Definition - Phases - models, LP problems formulation – Graphical solution, GLPP, Standard and Canonical forms of LPP- simplex methods- Big M, Two phase methods, Alternate optimal solutions, Duality in LP.

UNIT II  TRANSPORTATION  9
Transportation problems- Basic feasible solution, Optimal solution By MODI method, Balanced and Unbalanced TP, Degeneracy, Production problems. Assignment problems – Hungarian method Traveling salesman problems - Sequencing models- Johnson algorithm, n job 2 machines, n job 3 machines and n job m machines.

UNIT III  INVENTORY CONTROL  9
Types of inventory- Inventory cost - EOQ - Deterministic inventory problems – Purchase and Production models with and without shortages-EOQ with price breaks - Stochastic inventory problems - Multi product problems - Systems of inventory control (P and Q Systems)- Determination of buffer stock and re-order levels -Selective inventory control techniques (ABC, VED, SDE, etc.)

UNIT IV  QUEUING THEORY  9
Queuing system - Characteristics - symbols - Poisson process and exponential distribution -Single server queuing models - Multiserver queuing models, Simulation Monte Carlo technique- Inventory & Queuing problems.

UNIT V  PROJECT MANAGEMENT AND REPLACEMENT MODELS  9
Project management: Network logic – Ford-Fulkerson’s rule - AON diagram - CPM and PERT techniques, Critical path and float calculations Replacement models -types of failures – Gradual failures-replacement of items: Efficiency deteriorates with time, sudden failures- individual and group replacement policies.

OUTCOME:

Upon completion of this course, the students will be able to:

- Understand and apply the operations research techniques in industrial operations.

TEXT BOOKS:
REFERENCES:

PTGE7075 INTELLECTUAL PROPERTY RIGHTS L T P C
3 0 0 3

OBJECTIVE:
• To give an idea about IPR, registration and its enforcement.

UNIT I INTRODUCTION
Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad – Genesis and Development – the way from WTO to WIPO – TRIPS, Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

UNIT II REGISTRATION OF IPRs
Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad

UNIT III AGREEMENTS AND LEGISLATIONS

UNIT IV DIGITAL PRODUCTS AND LAW

UNIT V ENFORCEMENT OF IPRs
Infringement of IPRs, Enforcement Measures, Emerging issues – Case Studies.

TOTAL :45 PERIODS

OUTCOME:
• Ability to manage Intellectual Property portfolio to enhance the value of the firm.
TEXT BOOKS:

REFERENCES:

PTME7014 MARKETING MANAGEMENT

OBJECTIVE:
- To expose the students to newer concepts of marketing principles like strategic marketing concepts, segmentation, pricing, advertisement and strategic formulation.

UNIT I CONCEPTS IN MARKETING

UNIT II BUYING BEHAVIOUR AND MARKET SEGMENTATION
Cultural, Demographic factors, Motives, Types, Buying Decisions, Segmentation factors, Demographic, Psycho graphic and Geographic Segmentation, Process, Patterns. Services marketing and Industrial marketing.

UNIT III PRODUCT, PRICE AND MARKETING RESEARCH

UNIT IV MARKETING PLANNING AND STRATEGY FORMULATION

UNIT V ADVERTISING, SALES PROMOTION AND DISTRIBUTION

TOTAL:45 PERIODS
OUTCOME:
Upon completion of this course, the students will be able to:
- Understand the philosophies of marketing and should able to formulate market planning, strategies and could promote sales in effective manner.

TEXT BOOKS:

REFERENCES:

PTPH7152 \textbf{MATERIALS SCIENCE} \begin{tabular}{cccc} \hline L & T & P & C \\ \hline 3 & 0 & 0 & 3 \\ \hline \end{tabular} (Common to Manufacturing, Industrial, Mining, Aeronautical, Automobile and Production Engineering)

OBJECTIVE:
- To introduce the essential principles of materials science for mechanical and related Engineering applications.

UNIT I \textbf{PHASE DIAGRAMS} \hspace{1cm} 9
Solid solutions - Hume Rothery's rules - The phase rule - single component system - one-component system of iron - binary phase diagrams - isomorphous systems - the tie-line rule - the lever rule - application to isomorphous system - eutectic phase diagram - peritectic phase diagram - other invariant reactions – free energy composition curves for binary systems - microstructural change during cooling.

UNIT II \textbf{FERROUS ALLOYS AND HEAT TREATMENT} \hspace{1cm} 9
UNIT III MECHANICAL PROPERTIES


UNIT IV MAGNETIC, DIELECTRIC AND SUPERCONDUCTING MATERIALS


UNIT V NEW MATERIALS


OUTCOME:

• Upon completion of this course, the students can able to apply the different materials, their processing, and heat treatments in suitable application in mechanical engineering fields.

TEXT BOOKS:


REFERENCES:

OBJECTIVES:
- To understand the sources of vibration and noise in various systems.
- To apply the various control techniques to reduce the vibration and noise and improve the life of the components.

UNIT I BASICS OF VIBRATION
Introduction, classification of vibration: free and forced vibration, undamped and damped vibration, linear and non linear vibration, response of damped and undamped systems under harmonic force, analysis of single degree and two degree of freedom systems, torsional vibration, determination of natural frequencies.

UNIT II BASICS OF NOISE
Introduction, amplitude, frequency, wavelength and sound pressure level, addition, subtraction and averaging decibel levels, noise dose level, legislation, measurement and analysis of noise, measurement environment, equipment, frequency analysis, tracking analysis, sound quality analysis.

UNIT III AUTOMOTIVE NOISE SOURCES

UNIT IV TWO DIMENSIONAL VECTOR VARIABLE PROBLEMS
Vibration isolation, tuned absorbers, un-tuned viscous dampers, damping treatments, dynamic forces generated by IC engines, engine isolation, crank shaft damping, modal analysis of the mass elastic model shock absorbers.

UNIT V SOURCES OF NOISE AND ITS CONTROL
Methods for control of engine noise, combustion noise, mechanical noise, predictive analysis, palliative treatments and enclosures, automotive noise control principles, sound in enclosures, sound energy absorption, sound transmission through barriers

OUTCOME:
Upon completion of this course, the students will be able to:
- Appreciate the need and its relevance for vibration and noise studies
- Gain knowledge on measurement of vibration and noise levels in machineries and its components.
- Expose themselves to various control measures of both vibration and noise in different industrial applications.

TEXT BOOKS:

REFERENCES:

PTME7016 MEMS AND MICROSYSTEMS  L  T  P  C
3  0  0  3

OBJECTIVES:
- To understand the basic engineering concepts of MEMS.
- To gain knowledge about the various Micromanufacturing Techniques.
- To comprehend the working principle of Microsensors and Actuators.
- To realize the concepts of Microfluidics and the applications of MEMS.

UNIT I BASIC ENGINEERING FOR MEMS

UNIT II MICROMANUFACTURING TECHNIQUES
Photolithography, Ion Implantation, Diffusion, Oxidation, Chemical Vapour Deposition, Physical Vapour Deposition-Sputtering,Deposition by Epitaxy, Etching, Bulk Micromanufacturing, Micromachining Processes, LIGA Process, Microsystem Assembly and Testing.

UNIT III ELECTROSTATIC AND THERMAL BASED MEMS

UNIT IV PIEZO / RESISTIVE / ELECTRIC AND MAGNETIC BASED MEMS

UNIT V MICROFLUIDICS AND APPLICATIONS OF MEMS
Microfluidics - Fluid Mechanics Concepts, Design and Fabrication of Channels, Valves, Pumps, Case Studies - Accelerometer, Gyros, RF MEMS and MOEMS.

TOTAL:45 PERIODS
OUTCOMES:
Upon completion of this course, the students will be able to:

- Understand the working principle of MEMS and methods of manufacturing Microsystems.
- Select suitable microsystems for Industrial applications.

TEXT BOOKS:

REFERENCES:

PTME7017 NEW AND RENEWABLE SOURCES OF ENERGY  

OBJECTIVES:
- To instruct the importance of renewable energy sources and its utilization.
- To educate the various renewable energy technologies.

UNIT I SOLAR ENERGY  

UNIT II WIND ENERGY  

UNIT III BIO - ENERGY  

UNIT IV OCEAN AND GEOTHERMAL ENERGY  

UNIT V NEW ENERGY SOURCES  

TOTAL: 45 PERIODS
OUTCOME:
Upon completion of this course, the students will be able to:

- Know the importance of renewable energy sources utilization and various renewable energy technologies.

TEXT BOOKS:

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OBJECTIVE:
- To impart knowledge on various Non-Destructive Evaluation and Testing methods, Interpretation of results, theory and their industrial applications.

UNIT I  INTRODUCTION AND VISUAL INSPECTION METHODS 9
- NDT versus Mechanical testing, Need for NDT, Relative merits and limitations, various physical characteristics of materials and their applications in NDT.
- Visual Inspection - Unaided, Aided- Borescopes - Videoscopes, Special features in Borescopes, Selection of borescopes, Optical sensors, Microscopes & replication Microscopy Technique and applications.

UNIT II  LIQUID PENETRANT TESTING AND MAGNETIC PARTICLE TESTING 9

UNIT III  THERMOGRAPHY AND EDDY CURRENT TESTING 9
- Thermography – Introduction, Principle, Contact & Non-Contact inspection methods, Active & Passive methods, Liquid Crystal – Concept, example, advantages & limitations. Electromagnetic spectrum, infrared thermography- approaches, IR detectors, Instrumentation and methods and applications.
- Eddy current Testing – Principle, properties of eddy currents, Eddy current sensing elements, probes, Instrumentation, Types of arrangement, Advantages & Limitations, Interpretation of Results & applications.
UNIT IV  ULTRASONIC TESTING AND ACOUSTIC EMISSION TESTING  9
Ultrasonic Testing-Principle, Basic Equipment, Transducers, couplants, Ultrasonic wave, Variables in UT, Transmission and Pulse-echo method, Straight beam and angle beam, A-Scan, B-Scan & C-Scan, Phased Array Ultrasound & Time of Flight Diffraction, Advantages & Limitations, Interpretation of Results & Applications.

UNIT V  RADIOGRAPHY  9

TOTAL:45 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:

- Evaluate and interpret components / products through NDT either as Quality Assurance Team Member or Production Team Member.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
At the end of this course the students are expected to
- Understand the working principles of various non-traditional machining processes, their applications, advantages and limitations.
- The students can also able to learn advanced nano finishing processes, recent developments in the non-traditional machining processes and to compare them.

UNIT I       INTRODUCTION AND MECHANICAL ENERGY BASED PROCESSES
Introduction to non-traditional machining processes, need for non-traditional machining, classification of non-traditional machining processes, their applications, advantages, limitations. Abrasive jet machining, abrasive water jet machining, ultrasonic machining their working principles, equipments, effect of process parameters, applications, advantages and limitations.

UNIT II     CHEMICAL AND ELECTRO CHEMICAL ENERGY BASED PROCESSES
Chemical machining, electro-chemical machining, electro-chemical honing, electro-chemical grinding, electro-chemical deburring their working principles, equipments, effect of process parameters, applications, advantages and limitations.

UNIT III     THERMO-ELECTRIC ENERGY BASED PROCESSES
Electric discharge machining, wire electric discharge machining, laser beam machining, plasma arc machining, electron beam machining, ion beam machining their working principles, equipments, effect of process parameters, applications, advantages and limitations.

UNIT IV     ADVANCED NANO FINISHING PROCESSES
Abrasive flow machining, chemo-mechanical polishing, magnetic abrasive finishing, magneto rheological finishing, magneto rheological abrasive flow finishing their working principles, equipments, effect of process parameters, applications, advantages and limitations.

UNIT V     RECENT TRENDS IN NON-TRADITIONAL MACHINING PROCESSES
Recent developments in non-traditional machining processes, their working principles, equipments, effect of process parameters, applications, advantages and limitations. Comparison of non-traditional machining processes.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of this course the students are expected to understand
- The working principles of various non-traditional machining processes, their applications, advantages and limitations.
- Advanced nano finishing processes.
- Recent developments in the non-traditional machining processes.
- Comparison of non-traditional machining processes.

TEXT BOOKS:
REFERENCES:

PTMA7071 PROBABILITY AND STATISTICS L T P C
3 0 0 3

OBJECTIVES:
- To make the students acquire a sound knowledge in statistical techniques that model engineering problems.
- The Students will have a fundamental knowledge of the concepts of probability.

UNIT I RANDOM VARIABLES 9
Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, Weibull and Normal distributions - Functions of a random variable.

UNIT II TWO–DIMENSIONAL RANDOM VARIABLES 9
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III TESTS OF SIGNIFICANCE 9
Sampling distributions - Tests for single mean, proportion, difference of means (large and small samples) – Tests for single variance and equality of variances – Chi square test for goodness of fit – Independence of attributes.

UNIT IV DESIGN OF EXPERIMENTS 9
Completely randomized design – Randomized block design – Latin square design - $2^2$ - Factorial design - Taguchi’s robust parameter design.

UNIT V STATISTICAL QUALITY CONTROL 9
Control charts for measurements ( $\bar{X}$ and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

TOTAL : 45 PERIODS
OUT COMES:
- Students will be able characterize probability models using probability mass (density) functions & cumulative distribution functions.
- The students can independently participate in the processes of analysis, planning, formulating strategies of development, decision-making, governing and management, and independent making of tactical and strategic decisions related to the statistics.

TEXT BOOKS:

REFERENCES:

PTME7019 PROCESS PLANNING AND COST ESTIMATION  L  T  P  C 
3  0  0  3

OBJECTIVE:
- To give an understanding of the fundamentals of Process Planning and estimation of appropriate costs of processes and products and applying these to manage competitive manufacturing systems and organisations.

UNIT I INTRODUCTION TO PROCESS PLANNING  9
Aims and Objectives, Place of process planning in Manufacturing cycle, Drawing interpretation, Dimensional tolerance vs Production processes.

UNIT II PROCESS PLANNING STEPS  9
Design of a process plan – Selection of production processes, tools and process parameters-Positioning and work holding devices, Selection of inspection devices and tools, Documenting the process plan, Simple Case studies.

UNIT III INTRODUCTION TO COST ESTIMATION  9
Importance, Types, Purpose, Components, Procedure, Classification of costs, Cost elements, Overhead expenses, Break-even analysis.

UNIT IV PRODUCTION COST ESTIMATION  9
Estimation of production cost for - Casting processes, Welding processes, and Forging processes.
UNIT V

ESTIMATION OF MACHINING TIME AND COST

Estimation of Machining time – Lathe operations, Drilling, Milling, Shaping and Planing, and Grinding, Cost estimation for machining processes.

OUTCOME:
Upon completion of this course, the students will be able to:

- Make logical, rational and economical process plans and realistic cost estimates of Components and Products.

TEXT BOOKS:

REFERENCES:

PTME7020

PRODUCT DESIGN AND DEVELOPMENT

OBJECTIVES:
- To understand the basic concepts of Product Design and Process Development.
- To appreciate the importance, various stages, concepts, management and prototyping of products.

UNIT I

INTRODUCTION


UNIT II

PRODUCT PLANNING, IDENTIFYING CUSTOMER NEEDS, PRODUCT SPECIFICATION

Product Planning Process: Identification of opportunities; evaluation and prioritization of projects; allocation of resources & plan timing; completion of pre-project planning. Identification of Customer Needs: Collection of raw data from customers; interpretation of raw data of customer needs; organization of the needs into a hierarchy; establishment of relative importance of needs. Product Specifications: Establishment of Target Specifications, Setting-up of Final Specifications.
UNIT III CONCEPT GENERATION, SELECTION, TESTING 9
Concept Generation: clarification of the problem; searching externally; searching internally, systematic exploration. Concept Selection: concept screening steps; concept scoring steps. Concept Testing: Defining the purpose of concept test; choosing a survey population; format; communicating the concept; measuring the customer response; interpretation of results.

UNIT IV PRODUCT ARCHITECTURE, INDUSTRIAL DESIGN, DESIGN FOR MANUFACTURE 9

UNIT V PROTOTYPING AND MANAGING PRODUCTS 9

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:

- Launch own ideas and the ideas of others, which would enable them to manage to work with innovation and development in large companies
- Apply new theories on innovation and change, including emerging paradigms such as user-driven innovation, open innovation and market forecasting in practice.

TEXT BOOK:

REFERENCES:

PTME7021 REFRIGERATION AND AIR - CONDITIONING L T P C
3 0 0 3

OBJECTIVE:
- To understand the principle of operation and design aspects of Refrigeration & Air conditioning systems and components.

UNIT I VAPOUR COMPRESSION REFRIGERATION SYSTEM 9
UNIT II REFRIGERANTS AND COMPONENTS OF REFRIGERATION SYSTEMS
Refrigerants desirable properties – Classification - Nomenclature - ODP & GWP; Equipments: Type of Compressors, Condensers, Expansion devices, Evaporators.

UNIT III OTHER REFRIGERATION SYSTEMS
Working principles of Vapour absorption systems and adsorption cooling systems - Steam jet refrigeration- Thermoelectric refrigeration- Air refrigeration - Magnetic - Vortex and Pulse tube refrigeration systems.

UNIT IV PSYCHROMETRIC PROPERTIES AND PROCESSES

UNIT V AIR CONDITIONING SYSTEMS AND LOAD ESTIMATION
Air conditioning loads: Outside and inside design conditions; Heat transfer through structure, Solar radiation, Electrical appliances, Infiltration and ventilation, internal heat load; Apparatus selection; fresh air load, human comfort & IAQ principles, effective temperature & chart, calculation of summer & winter air conditioning load; Classifications, Layout of plants; Air distribution system. Air Conditioning Systems with Controls: Temperature, Pressure and Humidity sensors, Actuators & Safety controls, Filters.

OUTCOME:
Upon completion of this course, the students will be able to:
- Appreciate the principles of operation of different Refrigeration and Air conditioning systems in total as well as the significance of the various component system.

TEXT BOOKS:

REFERENCES:
UNIT II    LIFE DATA ANALYSIS

UNIT III    RELIABILITY ESTIMATION
Series parallel configurations – Parallel redundancy – m/n system – Complex systems: RBD approach – Baye’s method – Minimal path and cut sets - Fault Tree analysis – Standby system.

UNIT IV    RELIABILITY MANAGEMENT

UNIT V    RELIABILITY IMPROVEMENT

TOTAL: 45 PERIODS

OUTCOME
• The course enable student the application of reliability in various field of engineering.

REFERENCES:

PTME7022    THEORY OF METAL FORMING
L  T  P  C
3  0  0  3

OBJECTIVES:
• To impart knowledge on plasticity, surface treatment for forming of various types of metal forming process.
• To study the basic concepts of metal forming techniques and force calculation in metal forming process.
• To study the thermo - mechanical regimes and its requirements in metal forming.

UNIT I    THEORY OF PLASTICITY
UNIT II  THEORY AND PRACTICE OF BULK FORMING PROCESSES  9
Analysis of plastic deformation in Forging, Rolling, Extrusion, rod/wire drawing and tube drawing – Effect of friction–calculation of forces, work done–Process parameters, equipment used–Defects–applications–Recent advances in Forging, Rolling, Extrusion and Drawing processes–Design consideration in forming.

UNIT III  SHEET METAL FORMING  9

UNIT IV  POWDER METALLURGY AND SPECIAL FORMING PROCESSES  9

UNIT V  SURFACE TREATMENT AND METAL FORMING APPLICATIONS  9

TOTAL:45 PERIODS

OUTCOME:
Upon completion of the course the students will be able to:
• Use of mechanical and thermodynamics principle of plastic deformation to form the components using different metal forming techniques.

TEXT BOOKS:

REFERENCES:
AIM
- To provide comprehensive knowledge about the principles, practices, tools and techniques of Total quality management.

OBJECTIVES
- To understand the need for quality, its evolution, basic concepts, contribution of quality gurus, TQM framework, Barriers and Benefits of TQM.
- To understand the TQM Principles.
- To learn and apply the various tools and techniques of TQM.
- To understand and apply QMS and EMS in any organization.

UNIT I    INTRODUCTION  
Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of product and service quality –Definition of TQM-- Basic concepts of TQM —Gurus of TQM (Brief introduction) -- TQM Framework- Barriers to TQM –Benefits of TQM.

UNIT II   TQM PRINCIPLES  

UNIT III   TQM TOOLS & TECHNIQUES I  

UNIT IV   TQM TOOLS & TECHNIQUES II  

UNIT V    QUALITY MANAGEMENT SYSTEM  

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to apply TQM concepts in a selected enterprise.
- Ability to apply TQM principles in a selected enterprise.
- Ability to apply the various tools and techniques of TQM.
- Ability to apply QMS and EMS in any organization.
TEXT BOOK:

REFERENCES:

PTME7023 TURBO MACHINERY

OBJECTIVE:
- To understand the process of energy transfer and operating principles of various turbomachines and their use for various engineering applications.

UNIT I WORKING PRINCIPLES 9

UNIT II CENTRIFUGAL FANS AND BLOWERS 9

UNIT III CENTRIFUGAL COMPRESSOR 9

UNIT IV AXIAL FLOW COMPRESSOR 9

UNIT V AXIAL AND RADIAL FLOW TURBINES 9

TOTAL:45 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:
- Explain the various systems, principles and applications and different types of turbo machinery components.
TEXT BOOKS:

REFERENCES: